Hop Varieties

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Wilammette
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Admiral – Admiral is often utilized for its displays of typical English aroma and bittering potential. It is also said to have a slight citrusy, orange flavor.

Aroma: Typical English aroma
Alpha Acids; 13.0% - 16.0%
Beta Acids: 4.8% – 6.1%
Cohumulone: 37% – 45% of alpha acids
Myrcene: 39% – 48% of total oil
Humulene: 23%-26% of total oil
Caryophyllene: 6.8% – 7.2%
Farnesene: 1.8% - 2.2%
Yield Potential: 800-1060 lb/ac
Possible Substitutions: Target, Northdown, Challenger

Ahtanum – Ahtanum is commonly used for its moderate bittering and aromatic properties. It has a citrus & floral character much like Cascade with some earthy or piney tones.

Aroma: Floral, Citrus
Alpha Acids: 5.7% - 6.3%
Beta Acids: 5.0% - 6.5%
Cohumulone: 30 – 35% of alpha acids
Myrcene: 50% – 55% of total oil
Humulene: 16% – 20% of total oil
Caryophyllene: 9% – 12% of total oil
Farnesene: <1% of total oil
Yield Potential: 1775 - 1950 lb/ac
Possible Substitutions: Amarillo, Cascade

Amarillo ® – Amarillo is characterized by its low cohumulone content and mid to high alpha. This variety has a flowery citrus like aroma (more orange than grapefruit) with a medium bittering value.

Aroma: Floral and citrus
Alpha Acids: 8 – 11%
Beta Acids: 6 – 7%
Cohumulone: 21 – 24%
Myrcene: 68 – 70%
Humulene: 9 – 11%
Caryophyllene: 2 – 4%
Farnesene: 2 – 4%
Yield Potential: 1200 - 1600 lb/ac
Possible Substitutions: Cascade, Centennial

Apollo – This variety is a very high-alpha hop and is excellent for bittering. It has citrus notes, emphasis on orange, resiny and spicy. When added late into the boil it provides a strong grapefruit and hoppy note.

Aroma: Aromatic, pleasant
Alpha Acids: 15 - 19%
Beta Acids: 5.5 – 8%
Cohumulone: 24 – 28% of alpha acids
Myrcene: 30 – 50% of total oil
Humulene: 20 – 35% of total oil
Caryophyllene: 14 – 20%
Farnesene: <1% of total oil
Yield Potential: 2600-3000 lb/ac
Possible Substitutions: CTZ, Nugget

Aurora – This is a European hop with an atypical flavor profile; passion fruit, mangoes, and other tropical fruit. It also has an intense but pleasing aroma.

Aroma: Intense and pleasant hoppy aroma
Alpha Acids: 7-9%
Beta Acids: 3-5%
Cohumulone: 23-28% of alpha acids
Myrcene: 35-53%
Humulene: 20-27% of total oil
Caryophyllene: 4-8% of total oil
Farnesene: 6-9%
Yield Potential: 1695 lb/ac
Possible Substitutions: Northern Brewer

Bravo – This variety is an excellent bittering hop that provides pleasant fruity and floral aroma characteristics. It's also what is considered a super high-alpha variety.

Aroma: Fruity and floral
Alpha Acids: 14-17%
Beta Acids: 3-4%
Cohumulone: 29 – 34% of alpha acids
Myrcene: 20 – 50% of total oil
Humulene: 18 – 20% of total oil
Caryophyllene: 10 – 12% of total oil
Farnesene: <1% of total oil
Yield Potential: 2700-3100 lb/ac
Possible Substitutions: CTZ

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Brewer's Gold (US) – A well known aroma variety grown both in the UK and the US. Brewer's Gold has a higher alpha in the US. It has a resiny, spicy aroma and flavor with hints of black currant. It has a sharp bittering quality.

Aroma: Blackcurrant, fruity, spicy
Alpha Acids: 8 – 10%
Beta Acids: 3.5 – 4.5%
Cohumulone: 40 – 48% of alpha acids
Myrcene: 37- 40% of total oil
Humulene: 29 – 31% of total oil
Caryophyllene: 7 – 7.5% of total oil
Farnesene: <1% of total oil
Yield Potential: 2400 lb/ac
Possible Substitutions: Bullion

Cascade – Cascades are an aroma variety with low amounts of alpha acids and very distinct medium strength aroma. This variety is also agronomically strong while giving a distinct citrus/grapefruit aroma.

Aroma: Floral, citrus (grapefruit)
Alpha Acids: 4.5 – 7%
Beta Acids: 4.8 – 7%
Cohumulone: 33 – 40% of alpha acids
Myrcene: 45 – 60% of total oil
Humulene: 8 – 13% of total oil
Caryophyllene: 3 – 6% of total oil
Farnesene: 3 – 7% of total oil
Yield Potential: 1430-1960 lb/ac
Possible Substitutions: Centennial, Amarillo

Centennial – A newer aroma variety with a high alpha and good finishing qualities. These hops are dual purpose and very balanced. It is also known as Super Cascade.

Aroma: Medium intense with floral & citrus
Alpha Acids: 9.5 – 11.5%
Beta Acids: 3.5 – 4.5%
Cohumulone: 29 – 30% of total oil
Myrcene: 45 – 55 of total oil
Humulene: 10 – 18% of total oil
Caryophyllene: 5 – 8% of total oil
Farnesene: <1% of total oil
Yield Potential: 1500 - 1750 lb/ac
Possible Substitutions: Cascade, Amarillo

Challenger – Challengers were bred to combine technically good aroma with higher levels of alpha acids, and good agronomic properties. It is a very popular dual-purpose hop with refined spicy notes, fruity, more orange or tangerine.

Aroma: Mild to moderate; spicy
Alpha Acids: 6.5 – 8.5%
Beta Acids: 4 – 4.5%
Cohumulone: 20 – 25% of alpha acids
Myrcene: 30 – 42% of total oil
Humulene: 25 – 32% of total oil
Caryophyllene: 8 – 10% of total oil
Farnesene: 1 – 3% of total oil
Yield Potential: 1400-1800 lb/ac
Possible Substitutions: Cluster, US and German Perle, Northern Brewer

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Chelan – This variety is a high alpha and high beta acids hop. It is a daughter of Galena so they have similar value data.

Aroma: Pleasant citrus notes
Alpha Acids: 12 – 14.5%
Beta Acids: 8.5 – 9.8%
Cohumulone: 33 – 35% of alpha acids
Myrcene: 45 – 55% of total oil
Humulene: 12 -15% of total oil
Caryophyllene: 9 – 12% of total oil
Farnesene: <1% of total oil
Yield Potential: 2000-2400 lb/ac
Possible Substitutions: Galena

Chinook – This variety has high alpha-acids content and the beta acids content is low compared to other high alpha acids varieties. It provides a slightly spicy and very piney aroma with a strong bittering ability.

Aroma: Medium intense, spicy, piney, distinctive grapefruit
Alpha Acids: 12 – 14%
Beta Acids: 3 - 4%
Cohumulone: 29 – 35% of total oil
Myrcene: 35 – 40% of total oil
Humulene: 18–23% of total oil
Caryophyllene: 9 – 11% of total oil
Farnesene: <1% of total oil
Yield Potential: 1780-2230 lb/ac
Possible Substitutions: Columbus, Galena, Nugget

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Citra ™ - Is known for a distinctive citrus aroma that carries over to the beer it is used in. It has fairly high alpha acids and total oil content with low cohumulone content. It provides a super fruity, juicy apricot aroma.

Aroma: Strong citrus, fruity
Alpha Acids: 11 -13%
Beta Acids: 3.5 – 4.5%
Cohumulone: 22 -24% of alpha acids
Myrcene: 60 – 65% of total oil
Humulene: 11 -13% of total oil
Caryophyllene: 6 – 8% of total oil
Farnesene: 0% of total oil
Yield Potential: 1400-1600 lb/ac
Possible Substitutions: Unknown

Cluster- Cluster has medium alpha acids content and is generally used for bittering. Cluster can also give a black currant aroma/ flavor making it a good dual purpose hop.

Aroma: Floral and spicy
Alpha Acids: 5.5 – 8.5%
Beta Acids: 4.5 – 5.5%
Cohumulone: 37 – 43% of alpha acids
Myrcene: 45 – 55% of total oil
Humulene: 15 – 18% of total oil
Caryophyllene: 6 – 7% of total oil
Farnesene: <1% of total oil
Yield Potential: 1700-2140 lb/ac
Possible Substitutions: Galena

Columbus - This is a super high-alpha variety and is a low cohumulone hop which gives a clean but long-lasting bitterness to beer. Columbus is often described as having a citrusy and slightly woody aroma.

Aroma: Aromatic, pungent
Alpha Acids: 14.5 – 16.5%
Beta Acids: 4 – 5%
Cohumulone: 28 – 32% of alpha acids
Myrcene: 40 – 50% of total oil
Humulene: 12 – 18% of total oil
Caryophyllene: 9 – 11% of total oil
Farnesene: <1% of total oil
Yield Potential: 2000-2500 lb/ac
Possible Substitutions: CTZ, Chinook, Galena, Nugget

Crystal – A Triploid variety developed from the German hop variety Hallertauer, commonly used for its aromatic properties.

Aroma: Mild, spicy & floral
Alpha Acids: 3.5 – 5.5%
Beta Acids: 4.5 – 6.5%
Cohumulone: 20 – 26% of alpha acids
Myrcene: 40 -65% of total acids
Humulene: 18 -24% of total oils
Caryophyllene: 4 – 8% of total oils
Farnesene: <1% of total oil
Yield Potential: 1200-2000 lb/ac
Possible Substitutions: Amarillo, Cascade, Centennial

El Dorado – This new variety is a high alpha, high cohumulone hop with a good aroma.

Aroma: Orange, raisin, grape
Alpha Acids: 15-17%
Beta Acids: 6.5-7.5%
Cohumulone: 52-57% of alpha acids
Humulene: 8-11%
Caryophyllene: 6-8%
Farnesene: <1% of total oil

Fuggle – Fuggle contributes flavor, aroma, and balanced bitterness to ales. Their aroma is more earthy and less sweet than Kent Goldings. They are also known as Styrian Goldings.

Aroma: Mild, pleasant in UK; early in US
Alpha Acids: 3 – 5.6%
Beta Acids: 2 – 3%
Cohumulone: 25 – 30% of alpha acids
Myrcene: 24 - 28% in UK; 40 – 50% in US
Humulene: 33 -38% in UK; 20 - 26% in US
Caryophyllene: 9 -13% in UK; 6 – 10% in US
Farnesene: 5 – 7% of total oil
Yield Potential: 1070-1600 lb/ac
Possible Substitutions: Styrian Golding, Willamette

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Galena – This variety is an excellent high alpha/beta acid hop. It has balanced bittering properties combined with a good aroma profile.

Aroma: Citrus
Alpha Acids: 11.5-13.5%
Beta Acids: 7.2-8.7%
Cohumulone: 36-40% of alpha acids
Myrcene: 55-60% of total oil
Humulene: 10-13% of total oil
Caryophyllene: 4.5-5.5% of total oil
Farnesene: <1% of total oil
Yield Potential: 1700-2230 lb/ac
Possible Substitutions: CTZ, Chinook, Nugget, Tillicum

Galaxy – This variety, when used as a late addition for flavor and aroma, contributes a distinctive clean citrus and passionfruit character. This becomes more striking the later the addition.

Aroma: Pleasant, Citrus, Passionfruit
Alpha Acids: ~13.5 -14.8%
Beta Acids: ~ 5.8 - 6.0%
Cohumulone: 34 -36% of alpha acids
Myrcene: 33 - 42% of total oil
Humulene: 1 - 2% of total oil
Caryophyllene: 9 - 12% of total oil
Farnesene: 3 - 4% of total oil
Yield Potential: 2230-3390 lb/ac
Possible Substitutions: CTZ, Chinook, Nugget, Tillicum

Glacier – This excellent new variety has balanced bittering properties combined with a pleasant aroma profile, making it a good dual-purpose hop.

Aroma: Pleasant hoppiness
Alpha Acids: ~5.5%
Beta Acids: ~8.2%
Cohumulone: 11 -13% of alpha acids
Myrcene: 33-62% of total oil
Humulene: 24 -36% of total oil
Caryophyllene: 6.5-10% of total oil
Farnesene: <1% of total oil
Yield Potential: 2400-2600 lb/ac
Possible Substitutions: Willamette

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Golding (US) – Goldings are known for their classic English type aroma and tend to have a smooth, sweet flavor.

Aroma: Mild, delicate; classic English type
Alpha Acids: 4-6%
Beta Acids: 2-3%
Cohumulone: 23-28% of alpha acids
Myrcene: 25-35% of total oil
Humulene: 35-45% of total oil
Caryophyllene: 13-16% of total oil
Farnesene: <1% of total oil
Yield Potential: 900-1300 lb/ac
Possible Substitutions: Fuggle, Styrian Golding, Willamette

Hallertau (GR) – Is a highly acclaimed aroma variety.

Aroma: Mild & pleasant
Alpha Acids: 3.5-5.5%
Beta Acids: 3-4%
Cohumulone: 17-24% of alpha acids
Myrcene: 10-20% of total acids
Humulene: 30-35% of total oil
Caryophyllene: 7-10% of total oil
Farnesene: <1% of total oil
Yield Potential: 1150-1600 lb/ac
Possible Substitutions: Liberty

Hallertau Mittelfrüh – This variety is popular because of its fine aroma and average bitter content. It also has a pleasant, spicy, noble, mild herbal aroma.

Aroma: Mild & pleasant
Alpha Acids: 3-5.5%
Beta Acids: 3-5%
Cohumulone: 18-28% of alpha acids
Myrcene: 20 -28% of total oil
Humulene: 45-55% of total oil
Caryophyllene: 10-15% of total oil
Farnesene: <1% of total oil
Yield Potential: 800-1100 lb/ac
Possible Substitutions: Liberty, Ultra

Hallertau (US) – A versatile bittering and herbal finishing hop that is mildly aromatic with a very mild, slightly flowery, and somewhat spicy aroma.

Aroma: Very mild, slightly flowery and somewhat spicy
Alpha Acids: 3.5 -5.5%
Beta Acids: 3.5 – 5.5%
Cohumulone: 18-24% of alpha acids
Myrcene: 25-35% of total oil
Humulene: 30-38% of total oil
Caryophyllene: 13-16% of total oil
Farnesene: <1% of total oil
Yield Potential: 800-1250 lb/ac
Possible Substitutions: Liberty, German Hallertau

Hallertau Tradition – This variety can be described as having a fine aroma and average bitter content.

Aroma: Noble-aroma type
Alpha Acids: 4-7%
Beta Acids: 3-6%
Cohumulone: 24-30% of alpha acids
Myrcene: 17-32% of total oil
Caryophyllene: 10-15% f total oil
Farnesene: <1% of total oil
Yield Potential: 1560-1780 lb/ac
Possible Substitutions: Liberty, GR Hallertau

Hersbrucker – This traditional variety is a low cohumulone aroma hop with a mild pleasant aroma.

Aroma: Mild to medium; pleasant
Alpha Acids: 1.5-4%
Beta Acids: 2.5-6%
Cohumulone: 17-25% of alpha acids
Myrcene: 15-30% of total oil
Humulene: 20-30% of total oil
Caryophyllene: 8-13% of total oil
Farnesene: <1% of total oil
Yield Potential: 1400-1800 lb/ac
Possible Substitutions: Mt. Hood, French Strisselspalt

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Horizon – This Oregon based variety has a low cohumulone value and a high alpha. Due to its low cohumulone value, it is used for its aromatic and bittering properties to make clean tasting beers.

Aroma: Floral, spicy
Alpha Acids: 11-13%
Beta Acids: 6.5-8.5%
Cohumulone: 16-19% of total oil
Myrcene: 55-65% of total oil
Humulene: 11-13% of total oil
Caryophyllene: 7.5-9% of total oil
Farnesene: 2.5-3.5% of total oil
Yield Potential: 1900-2000 lb/ac
Possible Substitutions: Magnum

Kent Golding – Just like all Goldings, Kent Goldings are known for having a typical English aroma. The aroma can also be described as spicy, floral, earthy, and rounded.

Aroma: Gentle, fragrant and pleasant
Alpha Acids: 4-6.5%
Beta Acids: 1.9-2.8%
Cohumulone: 28-32% of alpha acids
Myrcene: 20-26% of total oil
Humulene: 38-44% of total oil
Caryophyllene: 12-16% of total oil
Farnesene: <1% of total oil
Yield Potential: 1200-1500 lb/ac
Possible Substitutions: UK Progress, US Golding

Liberty – This variety has an aroma similar to Hallertau Mittelfrueh due to its direct relation to this variety. It makes a good finishing hop and provides a very fine, mild aroma.

Aroma: Mild, slightly spicy
Alpha Acids: 3-5%
Beta Acids: 3-4%
Cohumulone: 24-30% of total oil
Myrcene: 20-40% of total oil
Humulene: 35-40% of total oil
Caryophyllene: 9-12% of total oil
Farnesene: <1% of total oil
Yield Potential: 1000-1700 lb/ac
Possible Substitutions: Crystal, H. Hersbrucker, H. Tradition

Magnum – These hops can be described as having a high alpha and yield. Magnums have no real distinct aroma character, so it is viewed favorably as a clean bittering hop

Aroma: Not distinct
Alpha Acids: 11-16%
Beta Acids: 5-7%
Cohumulone: 21-29% of total oil
Myrcene: 30-45% of total oil
Humulene: 30-45% of total oil
Caryophyllene: 8-12% of total oil
Farnesene: <1% of total oil
Yield Potential: 1340-1700 lb/ac
Possible Substitutions: CTZ, Nugget, Taurus

Millennium – This variety is being used primarily as a bittering hop with strong alpha potential. The Millennium was developed to improve brewing values and agronomic characteristics of existing high alpha acid varieties.

Aroma: Mild, herbal; similar to Nugget
Alpha Acids: 14.5-16.5%
Beta Acids: 4.3-5.3%
Cohumulone: 28-32% of alpha acids
Myrcene: 30-40% of total oil
Humulene: 23-27% of total oil
Caryophyllene: 9-12% of total oil
Farnesene: <1% of total oil
Yield Potential: 2400-2600 lb/ac
Possible Substitutions: CTZ, nugget

Mount Hood – These hops have a mild aroma, low beta and alpha acids, low cohumulone content in the alpha acids, and high humulene content in the essential oil. Used for bittering, aroma and finishing, this yields a clean and soft bitterness.

Aroma: Mild, somewhat pungent
Alpha Acids: 4-7%
Beta Acids: 5-8%
Cohumulone: 21-23% of alpha acids
Myrcene: 30-40% of total oil
Humulene: 30-38% of total oil
Caryophyllene: 13-16% of total oil
Farnesene: <1% of total oil
Yield Potential: 1520-1960 lb/ac
Possible Substitutions: Strisselspalt, Hallertauer, Hersbrucker

Northern Brewer – This variety has a good aroma and a high alpha. It is a dual purpose hop, used in combonation with other hops for bittering, woody, earthy, fruity and sometimes minty aroma and flavor.

Aroma: Medium to strong
Alpha Acids: 6-10%
Beta Acids: 3-5%
Cohumulone: 27-32% of alpha acids
Myrcene: 50-60% of total oil (US) 25-45% (GR) of total oil
Humulene: 30-50% of total oil
Caryophyllene: 10-20% of total oil
Farnesene: <1% of total oil
Yield Potential: 1000-1400 lb/ac
Possible Substitutions: CTZ, Galena, Chinook, Magnum

Nugget – The nugget variety has a mild aroma, low cohumulone in the alpha acids, and generally yields well. It is primarily used for bittering and provides a fairly sweet aroma.

Aroma: Pleasant herbal, fairly sweet
Alpha Acids: 11.5-14% (US) 9-13% (GR)
Beta Acids: 3-5.8%
Cohumulone: 22-30% of alpha acids
Myrcene: 48-55% (US) of total oil, 27-42% (GR) of total oil
Humulene: 16-19% (US) of total oil, 25-40% (GR) of total oil
Caryophyllene: 7-10% (US) of total oil, 10-20% (GR) of total oil
Farnesene: <1% of total oil
Yield Potential: 1700-2230 lb/ac
Possible Substitutions: Galena, Magnum, Columbus

Palisade ® – This variety has a moderately strong bittering quality, with a grassy, apricot-like aroma that's often described as "pretty". Palisades also provide a moderate bittering quality.

Aroma: Good
Alpha Acids: 5.5-9.5%
Beta Acids: 6-8%
Cohumulone: 24-29% of alpha acids
Myrcene: 9-10% of total oil
Humulene: 19-22% of total oil
Caryophyllene: 16-18% of total oil
Farnesene: <1% of total oil
Yield Potential: 2200-3000 lb/ac
Possible Substitutions: Willamette

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Perle – Perle provides a nice combination of high alpha and good aroma. It also has a fairly high yield. This variety has a combination of the Northern Brewer's minty flavor and the spicy nobleness of other German hops.

Aroma: Moderately intense and pleasant
Alpha Acids: 4-9%
Beta Acids: 2.5-4.5%
Cohumulone: 29-35% of total oil
Myrcene: 20-35% of total oil
Humulene: 35-55% of total oil
Caryophyllene: 10-20% of total oil
Farnesene: <1% of total oil
Yield Potential: 1160-1600 lb/ac
Possible Substitutions: Northern Brewer

Pilgrim – This variety provides a spicy earthy character similar to Target but more pronounced, and is considered a dual purpose hop. Its distinctive aroma comes from its high selinine levels.

Aroma: Distinctive; strong
Alpha Acids: 9-13%
Beta Acids: 4.3-5%
Cohumulone: 36-38% of alpha acids
Myrcene: 25-36% of total oil
Humulene: 15-19% of total oil
Caryophyllene: 7-8% of total oil
Farnesene: .3% of total oil
Yield Potential: 2028 lb/ac
Possible Substitutions: Target, Challenger

Premiant - This variety is a great bittering hop as well as a finishing hop. Premiants are much hoppier in aroma than Target due to their higher humulene levels.

Aroma: Mild and pleasant
Alpha Acids: 7-11%
Beta Acids: 3.5-6%
Cohumulone: 18-23% of alpha acids
Myrcene: 35-50% of total oil
Humulene: 25-35% of total oil
Caryophyllene: 7-13% of total oil
Farnesene: 1.5-3% of total oil
Yield Potential: 1700-2000 lb/ac
Possible Substitutions: Saaz

Saaz (Czech) – This variety is a classic "noble" aroma hop. It is considered a spicy hop with a soft aroma and bitterness. It's aroma has been described as earthy, spicy, herbal, and similar to cinnamon.

Aroma: Very mild with pleasant hoppy notes
Alpha Acids: 3-4.5%
Beta Acids: 3-4.5%
Cohumulone: 24-28% of alpha acids
Myrcene: 20-25% of total oil
Humulene: 40-45% of total oil
Caryophyllene: 10-12% of total oil
Farnesene: 11-15% of total oil
Yield Potential: 800-1350 lb/ac
Possible Substitutions: US Saaz, US Sterling

Saaz (US) – Very similar to Czech Saaz but lacks some of the fineness of aroma. Their aroma has been described as spicy, and earthy.

Aroma: Intense and pleasant
Alpha Acids: 3-6%
Beta Acids: 4.5-8%
Cohumulone: 23-26% of alpha acids
Myrcene: 24-40% of total oil
Humulene: 15-25% of total oil
Caryophyllene: 10-12% of total oil
Farnesene: 14-20% of total oil
Yield Potential: 600-1000 lb/ac
Possible Substitutions: Czech Saaz, Sterling

Santiam – This variety is an excellent aroma hop that provides a floral and slightly spicy aroma with a mid-range alpha. It is very similar in aroma to Tettnanger.

Aroma: Herbal, noble hop aroma
Alpha Acids: 5.5-7%
Beta Acids: 7-8.5%
Cohumulone: 20-22% of alpha acids
Myrcene: 30-45% of total oil
Humulene: 20-25% of total oil
Caryophyllene: 5-8% of total oil
Farnesene: 13-16% of total oil
Yield Potential: 1400-2100 lb/ac
Possible Substitutions: Tettnanger, Spalt

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Simcoe ® – This variety offers a pine-like aroma and high bittering potential. Simcoe's also impart a distinct aroma and flavor as a late addition.

Aroma: Unique pine-like aroma
Alpha Acids: 12-14%
Beta Acids: 4-5%
Cohumulone: 15-20% of alpha acids
Myrcene: 60-65% of total oil
Humulene: 10-15% of total oil
Caryophyllene: 5-8% of total oil
Farnesene: <1% of total oil
Yield Potential: 2300-2500 lb/ac
Possible Substitutions: Magnum, Summit

Spalter – These hops are a noble all purpose hop that can be used for bittering, aroma, and finishing additions. It is especially valuable for adding aroma and flavor. It has a very refined, pleasant, slightly spicy flavor and aroma, and a clean finish.

Aroma: Mild and pleasant; slightly spicy
Alpha Acids: 2.5-5.5%
Beta Acids: 3-5%
Cohumulone: 22-29% of alpha acids
Myrcene: 20-35% of total oil
Humulene: 20-30% of total oil
Caryophyllene: 8-13% of total oil
Farnesene: 12-18% of total oil
Yield Potential: Less than 1000 lb/ac
Possible Substitutions: Saaz, Tettnanger

Sterling – This variety has an excellent noble hop aroma and smooth bitterness. It has an herbal, spicy aroma with hints of floral and citrus.

Aroma: Herbal, spicy; hint of floral, citrus
Alpha Acids: 6-9%
Beta Acids: 4-6%
Cohumulone: 22-28% of alpha acids
Myrcene: 44-48% of total oil
Humulene: 19-23% of total oil
Caryophyllene: 5-7% of total oil
Farnesene: 11-17% of total oil
Yield Potential: 1800-2000 lb/ac
Possible Substitutions: Saaz

Strisselspalter – This variety offers a good aroma with medium intensity and pleasant hoppiness.

Aroma: Delicate, slightly spicy
Alpha Acids: 4.5-6%
Beta Acids: 2-3.5%
Cohumulone: 25-30% of alpha acids
Myrcene: 27-33% of total oil
Humulene: 20-35% of total oil
Caryophyllene: 7-10% of total oil
Farnesene: 3-5% of total oil
Yield Potential: 1150-1500 lb/ac
Possible Substitutions: Fuggle, Willamette

Styrian Golding – This variety provides a delicate and slightly spice aroma mixed with reasonably decent alpha values. Styrian Golding's are used for bittering, finishing, and dry hopping for a wide variety of beers.

Aroma: Herbal, spicy; hint of floral, citrus
Alpha Acids: 6-9%
Beta Acids: 4-6%
Cohumulone: 22-28% of alpha acids
Myrcene: 44-48% of total oil
Humulene: 19-23% of total oil
Caryophyllene: 5-7% of total oil
Farnesene: 11-17% of total oil
Yield Potential: 1800-2000 lb/ac
Possible Substitutions: Saaz

Summit ™ – This variety is known for its unusually high alpha acids and strong aroma profile of grapefruit and citrus notes. Summits can be used for bittering or dry hopping.

Aroma: Strong citrus and grapefruit
Alpha Acids: 16-18%
Beta Acids: 4-6%
Cohumulone: 26-33% of alpha acids
Myrcene: 30-50% of total oil
Humulene: 15-25% of total oil
Caryophyllene: 10-15$ of total oil
Farnesene: <1% of total oil
Yield Potential: 2200-2700 lb/ac
Possible Substitutions: Amarillo, Cascade

Super Galena – This high alpha hop is comparable to Galena in bitterness and aroma profiles. Super Galenas have relatively high contents of bitter acids, beta acids, total oil, and humulene. They have a moderate, pleasant aroma.

Aroma: Citrus
Alpha Acids: 13-16%
Beta Acids: 8-10%
Cohumulone: 35-40% of alpha acids
Myrcene: 45-60% of total oil
Humulene: 19-24% of total oil
Caryophyllene: 6-14% of total oil
Farnesene: <1% of total oil
Yield Potential: 2500-2800 lb/ac
Possible Substitutions: Galena

Target - Target is widely used for its high alpha-acids content combined with an acceptable aroma; usually for bittering. They provide a unique herbal character, earthy, and grassy.

Aroma: Quite intense, pleasant English hop aroma
Alpha Acids: 9.5-12.5%
Beta Acids: 4.3-5.7%
Cohumulone: 35-40% of alpha acids
Myrcene: 45-55% of total oil
Humulene: 17-22% of total oil
Caryophyllene: 8-10% of total oil
Farnesene: <1% of total oil
Yield Potential: 1350-1800 lb/ac
Possible Substitutions: Fuggle, Willamette

Tettnanger – This variety provides a very fine aroma. It's rich flavor and flowery notes make it a versatile and favorite lager and light ale hop.

Aroma: Mild and pleasant; slightly spicy
Alpha Acids: 2.5-5.5%
Beta Acids: 3-5%
Cohumulone: 22-28% of alpha acids
Myrcene: 20-35% (GR) of total oil; 36-45% (US) of total oil
Humulene: 22-35% of total oil
Caryophyllene: 6-11% of total oil
Farnesene: 16-24% of total oil
Yield Potential: 900-1340 lb/ac
Possible Substitutions: Santiam, Spalt Select, German Spalt

Tillicum – This variety provides high alpha acids and very high beta acids. It is a full sister of Chelan and a daughter of Galena and, therefore, has similar analytical data to both varieties.

Aroma: Good aroma for bitter hop
Alpha Acids: 12-14.5%
Beta Acids: 9.3-10.5%
Cohumulone: 31-38% of alpha acids
Myrcene: 45-55% of total oil
Humulene: 13-16% of total oil
Caryophyllene: 6.8-8% of total oil
Farnesene: <1% of total oil
Yield Potential: 1800-2000 lb/ac
Possible Substitutions: Galena, Chelan

Tomahawk ® – This high alpha variety is a very aromatic bittering hop. It is commonly referred to as the trade name for Columbus.

Aroma: Aromatic, pungent
Alpha Acids: 14.5-16.5%
Beta Acids: 4-5%
Cohumulone: 28-32% of alpha acids
Myrcene: 40-50% of total oil
Humulene: 12-18% of total oil
Caryophyllene: 9-11% of total oil
Farnesene: <1% of total oil
Yield Potential: 2500-2700 lb/ac
Possible Substitutions: Nugget, Galena, Chinook, CTZ

Topaz – The Topaz is a seedless high alpha variety with a fruity aroma. The flavor of these hops is sometimes described as resiny, fruity, and piney.

Aroma: Strong, fruity and pleasant
Alpha Acids: 15-18%
Beta Acids: 6-7%
Cohumulone: 47-50% of alpha acids
Myrcene: 25-43% of total oil
Humulene: 11-13% of total oil
Caryophyllene: 10-11% of total oil
Farnesene: <1% of total oil
Yield Potential: 3400-3700 lb/ac
Possible Substitutions:

Ultra – This variety is characterized by it's lower alpha acids, which are lower that most U.S. aroma varieties, and it's spicy profile. It has a noble hop flavor and aroma quality. It makes an excellent finishing hop for certain German style lagers.

Aroma: Mild and pleasant; similar to Saaz
Alpha Acids: 2-3.5%
Beta Acids: 3-4.5%
Cohumulone: 23-38% of alpha acids
Myrcene: 15-25% of total oil
Humulene: 35-50% of total oil
Caryophyllene: 10-15% of total oil
Farnesene: <1% of total oil
Yield Potential: 1600-1800 lb/ac
Possible Substitutions: Saaz, Hallertau, Liberty

Vanguard – This variety is a low cohumulone hop used for its aromatic properties. It has been described as having an ever-so-slight herbal/citrus aroma that is quite restrained.

Aroma: Similar to Hallertau Mittelfrueh
Alpha Acids: 5.5-6%
Beta Acids: 6-7%
Cohumulone: 14-16% of alpha acids
Myrcene: 20-25% of total oil
Humulene: 45-50% of total oil
Caryophyllene: 12-14% of total oil
Farnesene: <1% of total oil
Yield Potential: 1350-1475 lb/ac
Possible Substitutions: Hallertauer, Saaz, Liberty

Warrior ® – This relatively new variety is characterized by a low proportion of cohumulone content in the alpha acids. Warriors are considered a general-purpose bittering hop that offers a neutral, clean bittering; primarily in ale styles. It has a relatively low cohumulone content, which contributes to a smooth, pleasing bitterness.

Aroma: Very mild
Alpha Acids: 14.5-16.5%
Beta Acids: 4.3-5.3%
Cohumulone: 22-26% of alpha acids
Myrcene: 40-50% of total oil
Humulene: 15-19% of total oil
Caryophyllene: 9-11% of total oil
Farnesene: <1% of total oil
Yield Potential: 2400-2600 lb/ac
Possible Substitutions: Nugget, Magnum, Columbus

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Willamette – This quality aroma hop provides a smooth soft flavor. It is characterized by a low alpha acid content and mild aroma similar to Fuggle. Willamette hops make a good dry hopping and finishing hop.

Aroma: Mild and pleasant, slightly spicy
Alpha Acids: 4-6%
Beta Acids: 3-4.5%
Cohumulone: 30-35% of alpha acids
Myrcene: 30-40% of total oil
Humulene: 20-27% of total oil
Caryophyllene: 7-8% of total oil
Farnesene: 5-6% of total oil
Yield Potential: 1340-1700 lb/ac
Possible Substitutions: US Tettnang, Styrian Golding, Fuggle

Zeus – The Zeus variety provides a super high alpha.

Aroma: Aromatic, pungent
Alpha Acids: 14.5-16.5%
Beta Acids: 4-5%
Cohumulone: 28-32% of alpha acids
Myrcene: 40-50% of total oil
Humulene: 12-18% of total oil
Caryophyllene: 9-11% of total oil
Farnesene: <1% of total oil
Yield Potential: 2400-3000 lb/ac
Possible Substitutions: Nugget, Galena, Chinook, CTZ

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